

## Beaufort Sea Play 6: Upper Ellesmerian

### Geological Assessment:

*Grasp UAI: AAAAAABAI*

*Play Area: 1852 square miles*

*Play Water Depth Range: 5 – 130 feet*

*Play Depth Range: 3,700 – 17,000 feet*

*Play Exploration Chance: 0.25*

Play 6, Upper Ellesmerian, Beaufort Sea OCS Planning Area, 2006 Assessment, Undiscovered Technically-Recoverable Oil & Gas			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	366	1,660	3,891
Total Gas (Tcfg)	0.514	2.282	5.395
Total Liquids (Mmbo)	275	1,254	2,930
Free Gas** (Tcfg)	0.240	0.955	1.996
Solution Gas (Tcfg)	0.274	1.327	3.399
Oil (Mmbo)	270	1,236	2,893
Condensate (Mmbc)	4	18	37
<p>* Risked, Technically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>BOE = total hydrocarbon energy, expressed in barrels-of-oil-equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

**Table 1**

Play 6, The Upper Ellesmerian Play, (1,660 Mmbo mean BOE) is the third ranked play in the Beaufort Sea Assessment Province. It contains over 12% of the hydrocarbon endowment in the province. The overall assessment results for play 6 are shown in [table 1](#). Seventy five percent of the resources in this play are expected to be

liquid hydrocarbons. [Table 5](#) reports the detailed assessment results by commodity for play 6.

[Table 3](#) summarizes the volumetric input data developed for the GRASP computer model of Beaufort Sea play 6. [Table 4](#) reports the risk model used for play 6. The location of play 6 is shown in [figure 1](#).

The play includes the sandstone reservoirs of the Triassic Sag River Formation and Triassic to Permian Sadlerochit Group. The depositional environment is marine shelf for the Sag River Formation while the Sadlerochit Group has shallow marine, fluvial, floodplain, alluvial fan delta, and point bar sediments. Carbonates within the Shublik Formation are sometimes porous. Potential hydrocarbon traps are formed by anticlines, faulted anticlines, unconformity truncations, faults, or stratigraphic pinchouts. This play was the primary objective of 13 OCS wells, including the Mukluk well. Two OCS wells discovered and tested two oil fields, Sandpiper and Northstar (Seal Island). Northstar, with recoverable reserves of 196 Mbbo is now producing from the Upper Ellesmerian play reservoirs. There are three onshore fields producing from the Upper Ellesmerian, including the main pool of the Prudhoe Bay field with 14 billion barrels recoverable oil (State of Alaska Division of Oil and Gas 2004 Annual Report), the Ivishak pool of the Endicott field with 17.7 million barrels in place oil (AOGCC, 1991b), and the North Prudhoe pool of Prudhoe Bay field with 12 million barrels in place oil (AOGCC, 1994, p. 2).

The primary risk for the Upper Ellesmerian

play is the presence of seal and the presence of reservoir facies at the prospect level.

Play 6, Upper Ellesmerian, Beaufort Sea OCS Planning Area, 2006 Assessment, Conditional BOE Sizes of Ten Largest Pools			
Assessment Results as of November 2005			
Pool Rank	BOE Resources *		
	F95	Mean	F05
1	129	834	2612
2	61	347	888
3	35	194	529
4	21	121	320
5	13	80	212
6	8	55	147
7	5	39	106
8	3	28	78
9	2.3	21	59
10	1.8	16	45
* Conditional, Technically-Recoverable, Millions of Barrels Energy-Equivalent (Mmboe), from "PSRK.out" file F95 = 95% chance that resources will equal or exceed the given quantity F05 = 5% chance that resources will equal or exceed the given quantity BOE = total hydrocarbon energy, expressed in barrels-of-oil- equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas			

**Table 2**

A maximum of 30 hypothetical pools is forecast by the aggregation of the risk model and the prospect numbers model for play 6. These pools range in mean conditional (un-risked) recoverable volumes from 1.5 Mmboe (pool rank 30) to 834 Mmboe (pool rank 1).

Pool rank 1 ranges in possible conditional recoverable volumes from 129 Mmboe (F95) to 2612 Mmboe (F05). [Table 2](#) shows the conditional sizes of the 10 largest pools in play 6.

[Table 6](#) reports statistics for the simulation pools developed in the *GRASP* computer model for play 6. In the computer simulation for the play, a total of 124,327 "simulation pools" were sampled for size. These

simulation pools can be grouped according to the USGS size class system in which sizes double with each successive class. Pool size class 10 contains the largest share (18,385, or 22%) of simulation pools (conditional, technically recoverable BOE resources) for play 6. Pool size class 10 ranges from 16 to 32 Mmboe. The largest pool among the 124,327 simulation pools falls within pool size class 18, which ranges in size from 4096 to 8192 Mmboe.

## GRASP Play Data Form (Minerals Management Service-Alaska Regional Office)

Basin: Beaufort  
Play Number: 06  
Play UAI Number: AAAAABAI

Assessor: Johnson/Scherr  
Play Name: Upper Ellesmerian

Date: 10/11/2005

Play Area: mi<sup>2</sup> ( million acres) 1852 (1185.3)  
Reservoir Thermal Maturity: % Ro

Play Depth Range: feet 3700 7900 17000  
Expected Oil Gravity: ° API 35  
Play Water Depth Range: feet 5 30 130

### POOLS Module (Volumes of Pools, Acre-Feet)

Fractile	F100	F95	F90	F75	F50	Mean/Std. Dev.	F25	F15	F10	F05	F02	F01	F00
Prospect Area (acres)-Model Input	50	163	244	603	1876		6011	11359	16840	29223			95263
Prospect Area (acres)-Model Output													
Fill Fraction (Fraction of Area Filled)	0.1			0.289	0.499		0.756			0.949		0.99	1
Productive Area of Pool (acres)	30	71	113	294	910	3084.8/5364.3	3111	5560	8342	14881			30000
Pay Thickness (feet)	38	96.0	112.9	148.0	200.0	221.4/105.929	270.2	317.6	354.3	416.6	500.0	564.7	1051.0

### MPRO Module (Numbers of Pools)

Play Level Chance	1	Prospect Level Chance	0.25	Exploration Chance	0.25
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Risk Model	Play Chance	Petroleum System Factors	Prospect Chance
		Adequate Seal	0.5
		Presence of formation	0.5

Fractile	F99	F95	F90	F75	F50	Mean/Std. Dev.	F25	F15	F10	F05	F02	F01	F00
Numbers of Prospects in Play	42.00	44.00	45.00	47.00	49.00	49.74/3.41	51.50	52.50	53.50	55.00	56.50	57.50	63.00
Numbers of Pools in Play	6	7	8	10	12	12.44/3.17	15	16	17	18	19	20	30

Minimum Number of Pools	0	Mean Number of Pools	12.44	Maximum Number of Pools	30
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### POOLS/PSRK/PSUM Modules (Play Resources)

Fractile	F100	F95	F90	F75	F50	Mean/Std. Dev.	F25	F15	F10	F05	F02	F01	F00
Oil Recovery Factor (bbl/acre-foot)	27.5	73.96	87.95	117.46	162	181.978/93.794	223.43	265.5	298.4	354.82	431.18	491	953
Gas Recovery Factor (Mcfg/acre-foot)	81.2	224.931	268.688	361.613	503	568.642/302.256	699.669	835.225	941.649	1124.834	1373.964	1570.004	3110
Gas Oil Ratio (Sol'n Gas)(cf/bbl)	90	170	230	390	720	1075.250/ 1034.163	1350	1900	2300	3200	4700		6000
Condensate Yield ((bbl/Mmcfg)	0.1470	1.5475	2.3368	4.6526	10.0000	18.332/23.706	21.4933	32.4058	42.7943	64.6212	102.7605	140.0002	143.0000

Pool Size Distribution Statistics from POOLS (1,000 BOE):  $\mu$  (mu)= 10.4319482  $\sigma^2$  (sigma squared)= 2.97583287 Random Number Generator Seed= 415368

BOE Conversion Factor (cf/bbl)	5620	Probability Any Pool Contains Both Oil and Free Gas (Gas Cap)	1
Probability Any Pool is 100% Oil	0	Fraction of Pool Volume Gas-Bearing in Oil Pools with Gas Cap	0.2
Probability Any Pool is 100% Gas	0		

Table 3. Input data for Beaufort Sea play 6, 2006 assessment.



# GRASP - Geologic and Economic Resource Assessment Model - PSUM Module Results

Minerals Management Service - Alaska OCS Region  
GRASP Model Version: 8.29.2005)  
Computes the Geologic Resource Potential of the Play

<b>Play UAI: AAAAAABAI</b>			<b>Play No. 6</b>		
World	Level	-	World	Level	Resources
Country	Level	-	UNITED	STATES	OF AMERICA
Region	Level	-	MMS	-	ALASKA REGION
Basin	Level	-	<b>BEAUFORT</b>	<b>SHELF</b>	
<b>Play</b>	<b>Level</b>	-	<b>Play</b>		<b>6 Upper Ellesmeria Play</b>
Geologist	Peter	Johnson			
Remarks	Play	6	2005 Assessment		
Run Date & Time:	Date	19-Sep-05	Time	13:48:25	

## Summary of Play Potential

Product	MEAN	Standard Deviation
<b>BOE (Mboe)</b>	1,660,100	1,156,000
<b>Oil (Mbo)</b>	1,236,400	869,670
<b>Condensate (Mbc)</b>	17,621	20,221
<b>Free (Gas Cap &amp; Nonassociated) Gas (Mmcfg)</b>	954,590	676,280
<b>Solution Gas (Mmcfg)</b>	1,327,400	1,302,000

10000 (Number of Trials in Sample)  
0.9998 (MPhc [Probability] of First Occurrence of Non-Zero Resource)  
Windowing Feature: used

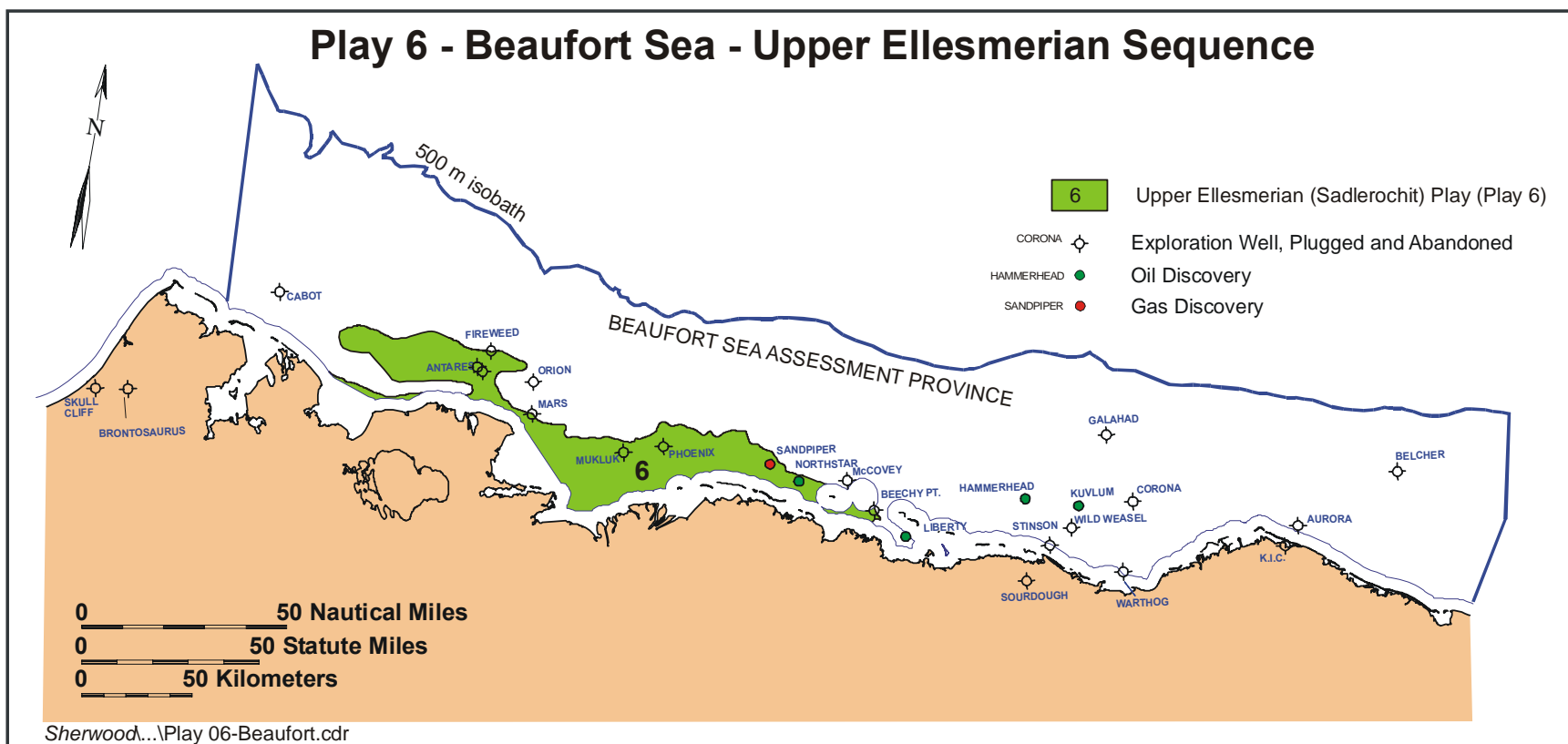
## Empirical Probability Distributions of the Products

Greater Than Percentage	BOE (Mboe)	Oil (Mbo)	Condensate (Mbc)	Free (Gas Cap & Nonassociated) Gas (Mmcfg)	Solution Gas (Mmcfg)
100	0	0	0	0	0
99.99	0	0	0	0	0
99	193,040	144,300	2,214	127,840	133,630
95	366,060	270,200	4,375	239,710	274,410
90	514,690	382,850	5,754	330,290	378,300
85	629,880	469,630	7,011	406,470	454,740
80	733,820	545,540	8,108	474,970	537,580
75	840,980	630,220	9,453	532,610	598,770
70	942,410	701,750	10,461	630,900	662,790
65	1,051,800	786,140	11,465	625,700	803,100
60	1,158,900	869,440	12,070	703,450	855,300
55	1,270,200	935,290	13,869	824,860	979,610
50	1,391,000	1,051,000	17,158	830,100	984,740
45	1,510,200	1,128,100	18,159	888,410	1,157,000
40	1,644,200	1,229,700	16,660	954,160	1,281,700
35	1,789,800	1,327,400	19,401	1,079,600	1,410,000
30	1,957,400	1,460,600	22,043	1,113,200	1,555,200
25	2,146,400	1,587,400	22,712	1,213,900	1,800,100
20	2,399,700	1,778,700	24,465	1,351,000	2,001,300
15	2,715,700	2,038,600	26,801	1,551,500	2,103,100
10	3,183,000	2,366,100	36,140	1,697,600	2,690,000
8	3,416,700	2,575,400	35,937	1,754,300	2,771,600
6	3,691,400	2,729,400	42,788	2,032,100	3,134,000
5	3,890,500	2,893,100	37,346	1,995,800	3,399,400
4	4,156,400	3,082,300	39,235	2,207,800	3,608,200
2	4,937,400	3,656,900	47,923	2,626,500	4,300,700
1	5,689,500	4,128,200	43,590	2,557,200	5,972,500
0.1	8,041,700	5,821,000	42,770	2,658,100	9,581,800
0.01	9,864,000	7,595,800	81,758	5,213,700	7,073,700
0.001	10,386,000	7,181,100	51,230	2,636,600	15,086,000

**Table 5.** Assessment results by commodity for Beaufort Sea play 6, 2006 assessment.

Basin: BEAUFORT SHELF				Model Simulation "Pools" Reported by "Fieldsize.out" GRASP Module																			
Play 06 - Upper Ellesmerian Play																							
UAI Key: AAAAAABAI																							
Classification and Size				Pool Count Statistics			Pool Types Count			Mixed Pool Range		Oil Pool Range		Gas Pool Range		Total Pool Range		Pool Resource Statistics (MMBOE)					
Class	Min (MMBOE)	Max (MMBOE)	Pool Count	Percentage	Trial Average	Trials w/Pool Avg	Mixed Pool	Oil Pool	Gas Pool	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Total Resource	Average Resource		
1	0.0312	0.0625	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000		
2	0.0625	0.125	2	0.001609	0.0002	0.0002	2	0	0	1	1	0	0	0	0	0	1	1	0.117180	0.117180	0.234359		
3	0.125	0.25	23	0.0185	0.0023	0.0023	23	0	0	1	1	0	0	0	0	0	1	1	0.139800	0.247777	4.793275		
4	0.25	0.5	170	0.136736	0.017	0.017002	170	0	0	1	2	0	0	0	0	0	1	2	0.265338	0.498657	69.288598		
5	0.5	1	1318	1.060108	0.1318	0.131813	1318	0	0	1	3	0	0	0	0	0	1	3	0.501997	0.999545	1027.302000		
6	1	2	4353	3.501251	0.4353	0.435344	4353	0	0	1	4	0	0	0	0	0	1	4	1.000243	1.999978	6633.690000		
7	2	4	8508	6.843244	0.8508	0.850885	8508	0	0	1	6	0	0	0	0	0	1	6	2.001071	3.999549	25234.475000		
8	4	8	12770	10.2713	1.277	1.277128	12770	0	0	1	8	0	0	0	0	0	1	8	4.000228	7.999538	75116.147000		
9	8	16	15997	12.866876	1.5997	1.59986	15997	0	0	1	9	0	0	0	0	0	1	9	8.000792	15.998764	185849.876000		
10	16	32	18385	14.787617	1.8385	1.838684	18385	0	0	1	9	0	0	0	0	0	1	9	16.004037	31.998238	424803.020000		
11	32	64	18086	14.547122	1.8086	1.808781	18086	0	0	1	9	0	0	0	0	0	1	9	32.000125	63.996312	830102.384000		
12	64	128	15697	12.625576	1.5697	1.569857	15697	0	0	1	9	0	0	0	0	0	1	9	64.000520	127.999641	1428305.000000		
13	128	256	12328	9.915787	1.2328	1.232923	12328	0	0	1	7	0	0	0	0	0	1	7	128.009649	255.980735	2237334.000000		
14	256	512	8736	7.026631	0.8736	0.873687	8736	0	0	1	6	0	0	0	0	0	1	6	256.023165	511.980516	3154980.000000		
15	512	1024	5243	4.217105	0.5243	0.524352	5243	0	0	1	6	0	0	0	0	0	1	6	512.095536	1023.958000	3725139.000000		
16	1024	2048	2196	1.76631	0.2196	0.219622	2196	0	0	1	4	0	0	0	0	0	1	4	1024.202000	2047.101000	3034815.000000		
17	2048	4096	468	0.376427	0.0468	0.046805	468	0	0	1	2	0	0	0	0	0	1	2	2056.930000	4084.658000	1236071.000000		
18	4096	8192	47	0.037804	0.0047	0.0047	47	0	0	1	1	0	0	0	0	0	1	1	4097.136000	7555.319000	235637.784000		
19	8192	16384	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000	0.000000		
20	16384	32768	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000	0.000000		
21	32768	65536	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000	0.000000		
22	65536	131072	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000	0.000000		
23	131072	262144	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000	0.000000		
24	262144	524288	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000	0.000000		
25	524288	1048576	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000	0.000000		
Not Classified			0	0	0	0	Below Class	0	0	0								Below Class	0.000000	0.000000	0.000000		
Totals			124327	100.000008	12.4327	12.433943	Above Class	0	0	0								Above Class	0.000000	0.000000	0.000000		
Number of Pools not Classified: 0				Min and Max refer to numbers of pools of the relevant size class that occur within any single trial in the simulation.																		Min and Max refer to aggregate resources of the relevant size class that occur within any single trial in the simulation.	
Number of Pools below Class 1: 0																							
Number of Trials with Pools: 9999																							

**Table 6.** Statistics for simulation pools created in computer sampling run for Beaufort Sea play 6, 2006 assessment.



**Figure 1.** Map location of Beaufort Sea play 6, 2006 assessment.